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Express Mail Label No.: EV 256130775
PROVISIONAL

Case Docket No. 22482/301

MS Provisional Application
ASSISTANT COMMISSIONER FOR PATENTS
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Alexandria, VA 22313-1450

Sir:

Transmitted herewith for filing is a Provisional Application under 37 C.F.R. § 1.53(c).

Inventors: Deborah Yungner, residing at 2300 Lukewood Drive, Chanhassen, MN 55317

For: EMERGENCY RESPONSE BACKUP UTILITY SYSTEM AND INTELLIGENT BUS

Enclosed are:

☒ Specification and Additional Information - 11 pages

☒ 6 sheets of drawings

☐ A check in the amount of $ to cover the filing fee is enclosed.

☒ Applicant hereby claims small entity status.

☒ The Commissioner is hereby authorized to charge payment of the small entity filing fee of **$80.00**, and any other fee associated with this communication or credit any overpayment to Deposit Account No. 50-1901.

Date: December 8, 2003

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PROVISIONAL

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	: Deborah Yungner
Filed	: Herewith
Title	: EMERGENCY RESPONSE BACKUP UTILITY SYSTEM AND INTELLIGENT BUS
Docket No	: 22482/301

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Paper(s) Enclosed:

☒ Provisional Application Transmittal
☒ Provisional Application – 17 pages
☒ Certificate of Express Mail
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By: Janet Byrne

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Pr visional Patent Applicati n

for

Emergency Response Backup Utility System and Intelligent Bus

The present invention is an emergency response backup utility system ("ERBUS") that is an integrated and mobile utility infrastructure for quick availability of resources, providing highly reliable backup power, purified water, environmentally controlled air, and communications during emergencies. This capability is contained in one convenient, highly mobile package that is designed to remove the burden of logistics support for users who do not have or cannot afford the technical staff and requisite infrastructure to maintain such equipment over its life cycle. ERBUS may offer multiple "best-in-class" commercial components packaged in one system that can be tailored for backup and emergency response situations and is capable of being towed behind a pickup truck, airlifted, or airdropped where needed.

In one embodiment, the ERBUS product may be a combination of any or all of the following components:

1. Air Filtration Module (AFM)

The Air Filtration Module (19) filters harmful airborne particulates to make air fit for breathing. It consists of an air blower (19), air filters (26), air ducting (33), and a self-contained enclosure (33). A variety of air purification methods can be adapted to the ERBUS based on the nature of the emergency needs of the customer. (Note – see diagram).

2. Environmental Control Module (ECM)

The Environmental Control Module (18) provides temperature control within a 15-20 degree range. It consists of a heat pump system, which is attached to the Air Filtration Module (19). The ECM is designed to be used to moderate the temperature of the air blown through the AFM in an enclosed environment.

3. Water Purification M dule (WPM)

The Water Purification Module (20) purifies water from available sources to make it fit for human consumption, or in some cases, it may render industrial wastewater safe for disposal in the environment. It consists of a water pump and motor (20), reverse osmosis filter system (27), auxiliary water tank (29), and various adapters and hoses (33). While reverse osmosis is projected to be the predominant purification process, a variety of purification methodologies can be adapted to the ERBUS to handle most kinds of water purification requirements.

4. Power Generation Module (PGM)

The Power Generation Module (21) provides basic power to all ERBUS components as well as auxiliary power for externally attached equipment and tools such as light sets (33), power saws, etc. It consists of an electric generator (21), fuel tank (30), battery and battery backup (31), starter motor (32), and extension cords (33).

5. Control Panel Module (CPM)

The Control Panel Module (22) provides autonomous and remote status of the various ERBUS modules. It consists of various dials and gauges, control switches for each module, graphics display, central processing and logic units, sensors, actuators, USB Port (12), Controller Bus Harness (14), Sensor Bus Harness (15), software code, and Intelligent Bus (IntelliBus) Communications Module (16), which is used for autonomous and remote monitoring and control of system components. The CPM (22) provides the integrated sensing, measuring, monitoring, diagnosing, actuation, and control over all ERBUS components. It is designed to be tailored for various emergencies and ERBUS configurations.

6. Auxiliary Communications Module (ACM)

The Auxiliary Communications Module (23) allows enhanced communications through an integration of satellite and radio communication methods. It consists of a transmission control head (23), antenna or dish (17), and headset and microphone (17). A variety of auxiliary communications modules can be adapted to the ERBUS to meet the specific needs of individual customers. The purpose of the ACM (23) is to provide remote command and control

communications in emergency disasters and relief operations where other communications means may not be available.

The ERBUS product encompasses several innovative technological elements, including but not limited to:

1. Integrated Modularity

Integrated modularity is achieved by adapting six interchangeable, "best-in-class" components on one ¾-ton trailer (28) and centrally monitoring and controlling them, remotely, using IntelliBus technology (1, 14-17, 34-36). Components include an Environmental Control Heat Exchanger (18), Air Filtration Unit (19), Water Purification and Pump Unit (20), Power Generator (21), Control Panel (22), and Auxiliary Communications (23). Supplemental components include various temperature probes (25); air filters (26); water filters and reverse osmosis devices (27); water and fuel tanks (29, 30); battery backup (31); starter motor (32); self-contained enclosure (33); light sets (33); and assorted adaptors, hoses, and extension cords (33).

2. Device Scalability

Device Scalability is achieved by interconnecting two or more ERBUS products using the Interconnecting Cable Assembly (24). Once a connection has been physically established, the Comparator Monitor (5), located on the IntelliBus motherboard (1), identifies and monitors all linked ERBUS products. This allows the primary ERBUS to coordinate the output of all ERBUS devices under heavy loads and to shut down individual units when they are not needed. Additionally, the controlling ERBUS shares workloads by cycling redundant modules through alternate duty cycles. To do this, commands are passed electronically from the IntelliBus Comparator Monitor Logic Unit (5) through the Control Bus Harness (14) and Interconnecting Cable Assembly (24) to all linked ERBUS devices. Operating status signals from linked ERBUS devices are then relayed back to the controlling ERBUS through the Interconnecting Cable Assembly (24) and Sensor Bus Harness (15). The benefit of interconnectivity is that one ERBUS system can pick up the load of other systems that have failed. Interconnectivity also allows the power generator of one ERBUS device to provide electric power to other ERBUS devices where

additional power may be needed or in cases where one of the latter's power generator has been taken off-line.

3. Component Plug and Play

Component plug and play capability is achieved by programming the Comparator Monitor Logic Unit (5) with individual OEM module parameters and using mounting brackets that are specially fabricated to adapt various components to the ERBUS product line. Programming is accomplished via the USB Port (12) using an IBM compatible computer (13). The Comparator Monitor (5) can also be remotely programmed through the IntelliBus Communications Module (16). Plug and play technology allows a wide variety of different sized components with various capabilities to be placed into ERBUS service to meet individual user requirements. Plug and play adaptability is designed to be remotely upgraded when necessary. The use of specially fabricated mounting adaptors permits OEM manufacturers to mount a wide-range of components in ERBUS products.

4. Integrated Command, Control, and Communications (C3)

Integrated Command, Control, and Communications consists of a three major technologies. They include the Integrated Bus System, IntelliBus Communications Module (ICM), and Logistics Support Center (LSC). The Integrated Bus System (IBS) integrates the overall command and control function of ERBUS products. It provides sensing, measuring, monitoring, diagnosing, actuation, and control over all on-board components and linked ERBUS devices. The Integrated Bus System includes a main motherboard (1), commercial sensors, commercial actuators, Control Bus Harness (14), Sensor Bus Harness (15), and Interconnecting Cable Assembly (24). The motherboard (1) is located on the Control Panel Module (22) and is attached to the Control and Sensor Bus Harnesses using standardized connectors. The motherboard (1) contains the IntelliBus Standard Sensor Protocol Adaptor (2), A-D Interface (3), Signal Decoder Circuitry (4), Comparator Monitor (5), Diagnostic Analyzer (6), Fault Code Generator (7), Data Storage Devices (8), Signal Converter (9), D-A Interface (10), IntelliBus Standard Controller Protocol Adaptor (11), and USB Port (12).

The IntelliBus Communications Module (ICM) provides a communications gateway between ERBUS products in the field and the Logistics Support Center (LSC) located in

Minnesota. It consists of the IntelliBus Communications Set (16); headset, cell phone, and antenna array (17); broadband satellites (34); Internet Service Provider (35); and DSL/Cable Modem (37) equipment located at the LSC. The ICM (16) is standard on all ERBUS products and is separate from the Auxiliary Communications Module (23).

The Logistics Support Center (LSA) incorporates an ERBUS signal reception capability using DSL or Cable Modem (37) and consists of a Warranty Call Center, which connects to users via digital phone line (38); Configuration Management activity (39); Spare Parts database; Maintenance Scheduling (41); Unscheduled Maintenance Repair (42); Scheduled Upgrades (43); and Product Monitoring Services (44). All these activities are based on a proprietary software enterprise management program.

ERBUS Operation

ERBUS can be started either on-site using the Control Panel Module (22) or by remote control from the Logistics Support Center (36) through the IntelliBus Communications Module (16). During operations, component status is polled via the Controller Bus (14) from signals generated by the Fault Code Generator (7). Signals are returned to the Signal Decoder (4) on the IntelliBus motherboard (1) over the Sensor Bus Harness (15), IntelliBus Standard Sensor Protocol Adaptor (2), and A-D Interface (3).

The Signal Decoder uses software programming to decipher and direct operating component identification information to the Comparator Monitor Logic Unit (5) and actual operating status signals to the Diagnostic Analyzer (6). The Comparator Monitor (5) identifies the various modules among all connected ERBUS products and fetches matching operating parameters for all detected equipment. Appropriate operating parameters are then sent to the Diagnostic Analyzer, which compares the specified operating parameters to the actual operating parameters detected from on-board sensors. When out-of-constraint parameters are detected, coded data are sent to the Fault Code Generator (7).

The Fault Code Generator produces the appropriate signals needed to correct problems and passes them through the Data Storage Device (8) to the Signal Converter (9) where they are converted to specific module correction packets. After being processed by the D-A Interface and passed through the IntelliBus Standard Controller Protocol Adaptor (14), they are directed

via the Controller Bus Harness (14) to the appropriate module where they are implemented through actuators. If no out-of-constraint conditions are detected, the Data Storage Device (8) passes normal operating instructions to the Signal Converter (9) based on coded data received from the Comparator Monitor (5).

The IntelliBus Motherboard (1), Controller Bus Harness (14), and Sensor Bus Harness (15) provide continuous sensor monitoring, operating diagnostics, and control over all ERBUS components. System status is collected in the Data Storage Device (9) and then can be downloaded using either an external IBM compatible computer (13) or virtually via the IntelliBus Communications Module (16). Innovations center on the ability of the IntelliBus technology to up-link current operational data through broadband satellite (34) and then down-link the data through an ISP (35) to the ERBUS Logistics Support Center (36). The LSC (36) maintains world-wide ERBUS standardization through configuration control (39). In this way, the LSC can efficiently administer ERBUS warranty services (38), locate and ship spare parts (40), conduct scheduled maintenance (41), handle unscheduled maintenance requests (42), and remotely upgrade systems in the field. Additionally, IntelliBus technology allows the LSC to monitor all ERBUS products in real-time to provide proactive logistical services. This proactive system attention reduces overall life cycle costs.

Explanation of the Enclosed Drawing

The ERBUS employs an integrated bus technology to diagnose, monitor, and control a set of integrated mechanical and communication devices. The illustration shows the relationships among these technologies. Note that all communications accessories are listed under item 17. Likewise, all accessories such as the self-contained enclosure, light sets, adaptors, hoses, ducting, and extension cords are listed under item 33.

Additional Informati n

ERBUS Description of the Invention

ERBUS is a scaleable, integrated, and mobile utility system providing immediate availability of resources such as potable water, electric power, filtered air, and communications. ERBUS offers multiple technologies packaged in one system that can be tailored for back up and/or emergency response situations. Each of the systems modules is controlled and monitored using state of the art iBUS command and control system.

The invention possesses numerous benefits and advantages over a non-integrated portable utility system. A non-integrated solution can contain stand-alone electric generators, water treatment systems, air filtration systems, and communication systems, with each of its own electrical, wiring, plumbing, space and environmental requirements as well as the frustrations of dealing with multiple vendors for maintenance and support. As an integrated, turnkey solution for utility systems, ERBUS provides the ability to quickly get the right solution to the right place without having multiple vendors with multiple logistics or operational requirements. One simply determines the best configuration of the four basic devices and then locates the units or systems that best fits the specific needs. In addition, automatic remote diagnosis and monitoring features results in a reduction of personnel, operating and ongoing maintenance costs.

The invention primarily pertains generally to integrated and mobile electric power generation, water treatment, air filtration, and communication equipment. More specifically, the invention relates to the production of electricity, potable water, filtered air, and communication in a unified physical unit that is capable of being transported on a person or with the use of vehicles via land, air, or water. The invention also provides that the devices in the unit interactively send, receive, and store information about the units and their condition. The information may change the operational status of any or all of the devices in the unit or may provide maintenance related information to people who are co-located with the equipment and/or with other support organizations.

The Universal Interface and Control System/Integration Bus (iBUS), the **Command and Control Module** provides for sensing, measurement, monitoring, diagnosing, actuation, and control of a variety of devices included in an ERBUS unit. It is a combination of computer programs, related mechanical devices and data conduits that change and monitor the operational status of a device or a plurality of devices. A system of computer programs cause the control signal and information to be carried to and received from control interface modules embedded in other devices on the unit.

iBUS also provides the connection in controlling the operation of one device or controlling the simultaneous operation of all devices in an ERBUS unit. Also enabled is for each device to control (or communicate with) one another when connected and within the scope of the main system simultaneously and interactively in a matrix configuration; it also can communicate with other ERBUS units. In addition, the control module

encompasses related devices, electronic, mechanical or combinations thereof, specifically designed to enable the matrix control configuration and function.

Physical dimensions on the control module will vary depending on the combination of the selected units. However, because of the environmental and climatic requirements for field use, it is anticipated that the control module will be "hardened" to comply with customer specifications, e.g. mil-spec, etc. It should be noted that not all of the following modules are required. The solution may be a combination of any or all of the following described modules.

The **Power Module** typically consists of an electric generator and storage cells coupled to a built-in power grid. The grid is a system of power outlets allowing auxiliary power sources including but not limited to fossil fuels, wind, water, solar, or fuel cells, to work in parallel or to substitute for the generator. Once connected to ERBUS, the auxiliary power input falls under the regulatory scope of the control module. Portions of the generator produce the power for the control module, the water purification module, the air filtration module, and the communication module. The bulk of the electricity produced will be conveniently available for local area consumption to power emergency equipment, lighting, and other desired electrical devices, including provisional power to a given or existing infrastructure that of which power has failed (ie, elevators, subway stations, air transportation carriers).

The power module provides electricity to power other devices in the ERBUS unit and other potential external equipment and tools. This module consists of an electric generator that may be powered by fossil fuels, wind, solar, water, and fuel cells. The module typically is comprised of an engine powered generator set configured with automatic, electronic system controls to produce electrical power at a quality level consistent with that provided by an electrical utility. The management of this electrical power produced by the generator set will be connected, or disconnected, to the ERBUS power grid by means of automatic transfer switches (or switch gear). The switchgear will work in conjunction with the iBUS control system to ensure proper management of various sources of electrical power.

The **Water Module** purifies and disinfects water from available sources to make it fit for human consumption or in some cases it may render industrial wastewater safe for disposal to the environment. While reverse osmosis (RO) is projected to be the predominant purification process, a variety of purification and disinfecting media or methods can be adapted to the ERBUS to handle most water impurities. The control module releases a warning and executes a preprogrammed action plan when the consumables such as the purification cartridge degrade to a level requiring replacement. The ERBUS unit provides for the use of a variety of purification and disinfecting media or methods with the installed control interface module and auxiliary systems.

Similar to the water module, the **Air Module** filters harmful air borne particulates to make it fit for humans to breathe. A variety of purification and disinfecting media or methods can be adapted to the ERBUS to handle most emergency situations. The control module releases a warning and executes a preprogrammed action plan when the consumables such as the filter cartridge degrade to a level requiring replacement. The ERBUS unit provides for the use of a variety of purification and disinfecting media or methods with the installed control interface module and auxiliary systems.

While the power module can provide electricity for local area communication, it is the transmission and receiving capability that makes the **Communication Module** important for remote command and control in back up and/or emergency disasters and relief operations. The module may consist of a two-way satellite transmission, a two-way base camp system and two-way communication bridges. The module also provides for two-way long-range transfer of data. As with the water module, the control interface module of the iBUS allows a variety of communication media to become an integral part of the unit. The communication media can be in the form of voice, video, and data. Customer specified communications options could be readily configured with the iBUS "plug & play" universal capabilities.

The invention pertains generally to a system of computer programs, related mechanical devices, and data conduits that affect a change in the operational status of a device or a plurality of devices. More specifically, the invention relates to a group of computer programs and mechanical devices that provides for sensing, measurement, monitoring, diagnosing, actuation, and control of a variety of devices including those devices that produce electricity, treated water, filtered air, and two-way communication, as found in the control module housed as the integration technology in the ERBUS (Emergency Response Back Up Utility Systems) product. It is the electronic component and the communications device of the ERBUS system. It is the harness that allows for the integration of diverse systems and technologies with the ability to connect, control, communicate, monitor, and diagnosis the operations of the unit(s) and its system status.

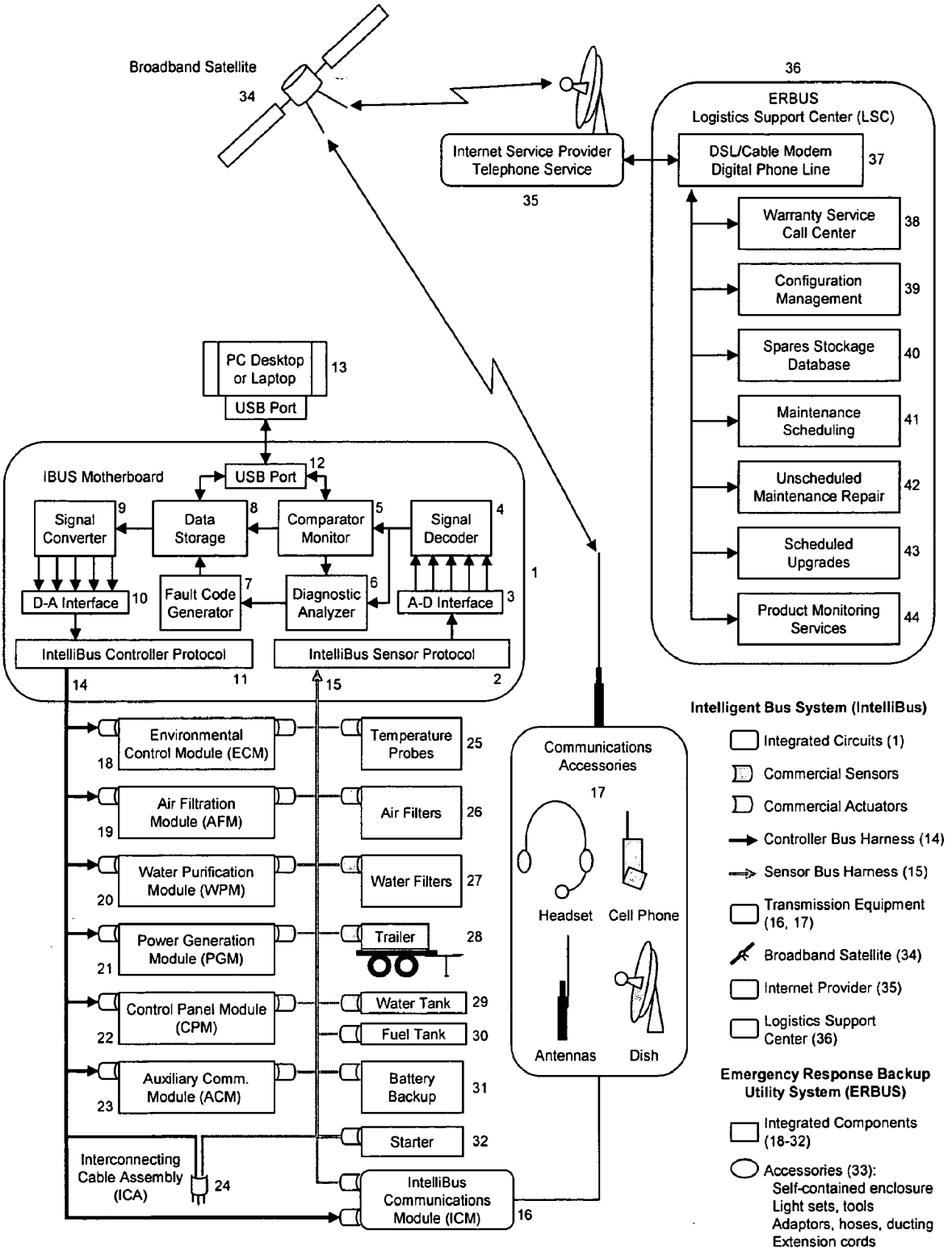
iBUS, the command and control module provides for sensing, measurement, monitoring, diagnosing, actuation, and control for a variety of devices included in an ERBUS (Emergency Response Back Up Utility Systems) product. It is a combination of computer programs, related mechanical devices and data conduits that change and monitor the operational status of a device or a plurality of devices. A system of computer programs cause the control signal and information to be carried to and received from control interface modules embedded in other devices on the unit.

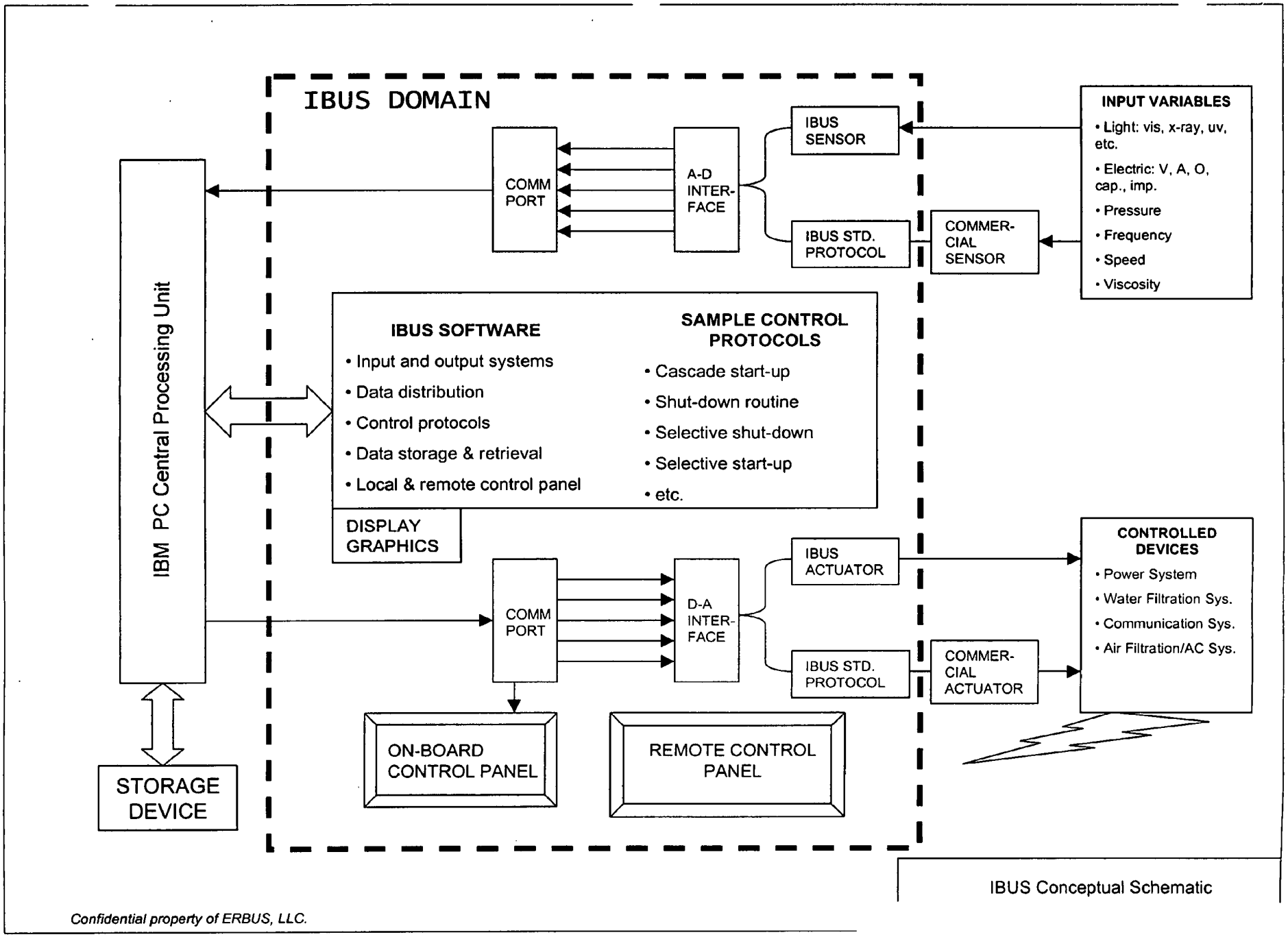
A typical control module includes central processing units, sensors, storage devices, storage cells, actuators, and peripheral equipment with computer programs compatible with the primary control unit. It turns the other ERBUS modules on or off and operates the modules at preset levels. Time stamped operating data are stored for real time control and/or downloaded for systems analysis.

iBUS also provides the connection in controlling the operation of one device or controlling the simultaneous operation of all devices in an ERBUS unit. Also enabled is for each device to control (or communicate with) one another when connected and within the scope of the main system simultaneously and interactively in a matrix configuration; it can also communicate with other ERBUS units. In addition, the control module encompasses related devices, electronic, mechanical, or combinations thereof, specifically designed to enable the matrix control configuration and function.

The uniqueness of the invention over existing control methodologies and systems is the wide range of operational control the said main control system enables: from an autonomous operation of a single device to an autonomous and simultaneously interactive operation of a plurality of devices in multiple locations.

Physical dimensions on the control module will vary depending on the combination of the selected units. However, because of the environmental and climatic requirements for field use, it is anticipated that the control module will be "hardened" to comply with customer specifications, e.g. mil-spec, etc. It should be noted that not all of the following modules are required. The solution may be a combination of any or all of the following ERBUS modules: Power Module, Water Module, Air Module, and Communication Module. iBUS allows for "plug & play" universal capabilities.

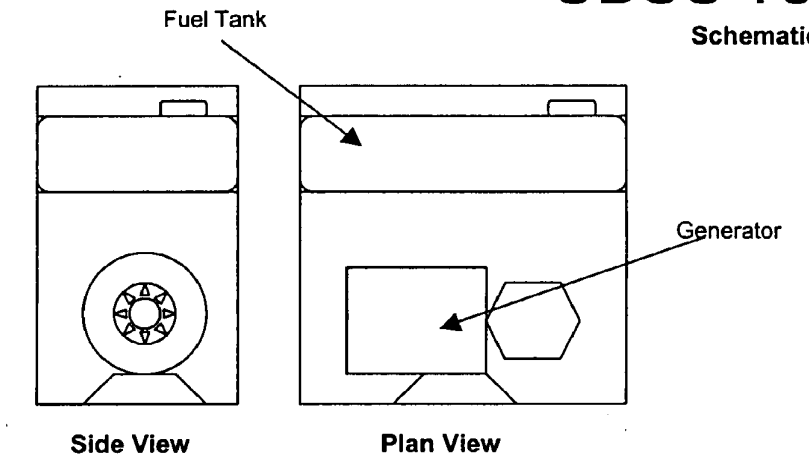


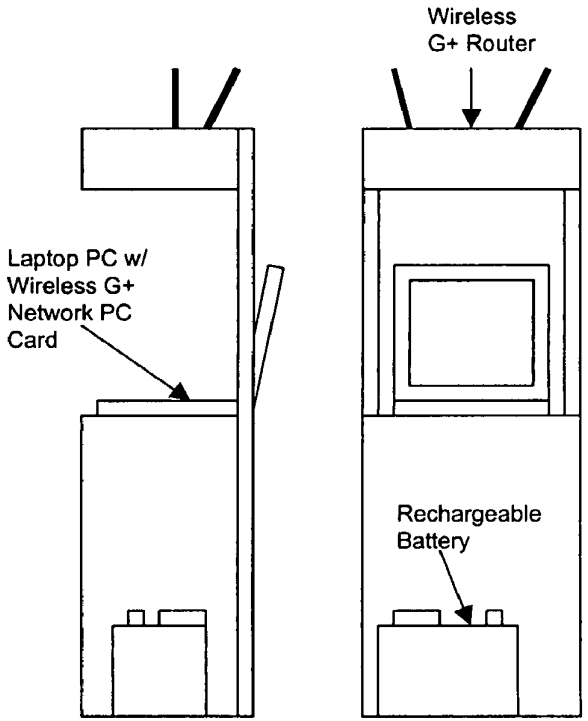


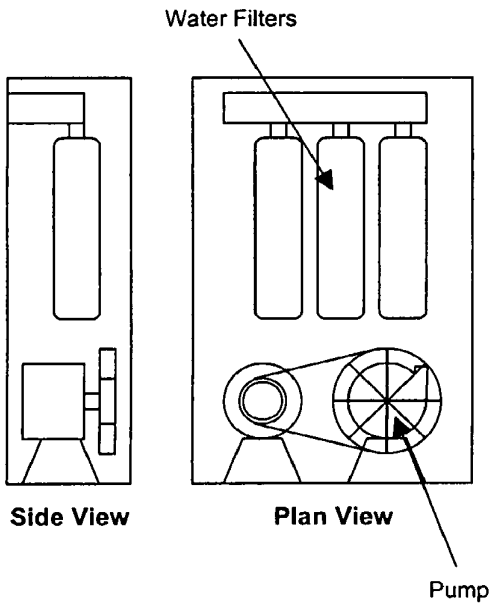
IBUS Conceptual Schematic

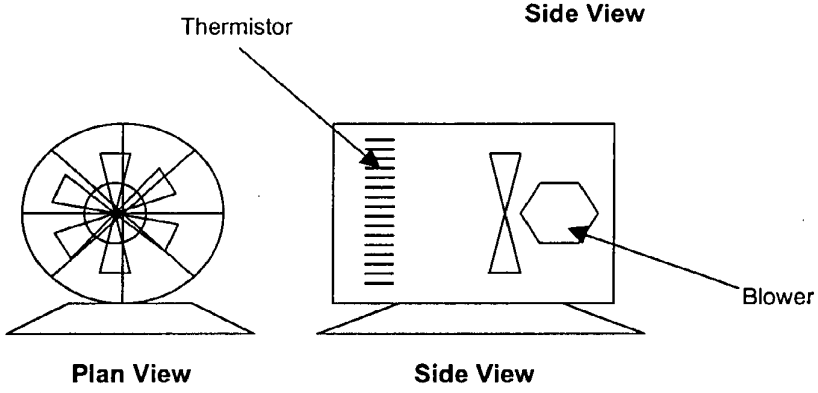
UBUS Test Bench

Schematic Diagram









UBUS Test Bench

Purpose

- To demonstrate UBUS functionality
- On-going performance testing of UBUS design concepts

Short Term Test Bench Goals

- To demonstrate UBUS remote on-off of ERBUS modules.
- Display on-off status on remote PC.
- Display selected generator operating parameters on remote PC.
- Display selected water filtration parameters on remote PC.
- Display 'room temperature' on remote PC.

Estimated Bill of Materials

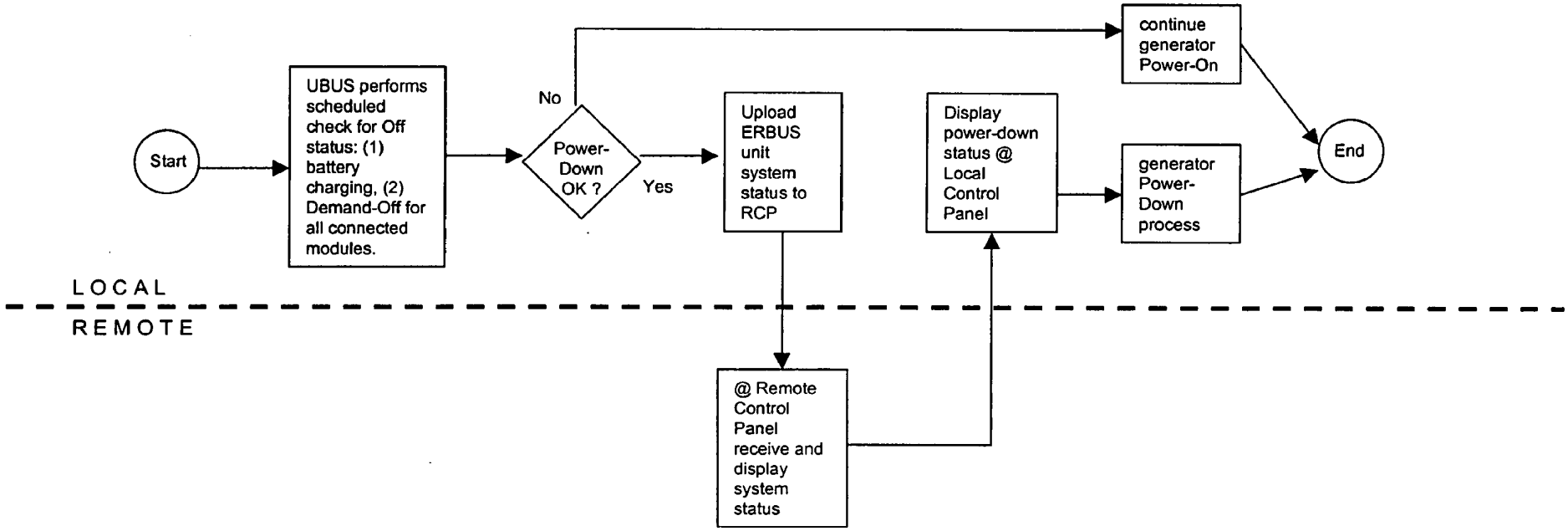
1 – Honda Powerstation 10Kva	$ 4,000.00
1 – Installation kit	224.91
1 – Raindance LCX 1000 RO	2,545.00
1 – Linksys G+ router	129.99
2 – Linksys G+ PC card	159.98
1 – ISP service, 12 months	240.00
2 – Laptop PC	3,000.00
1 – PC OS and basic software	1,000.00
1 – Evironizer, remote, thermostat	79.99
Sub-Total	$11,379.87

x – National Instruments interface

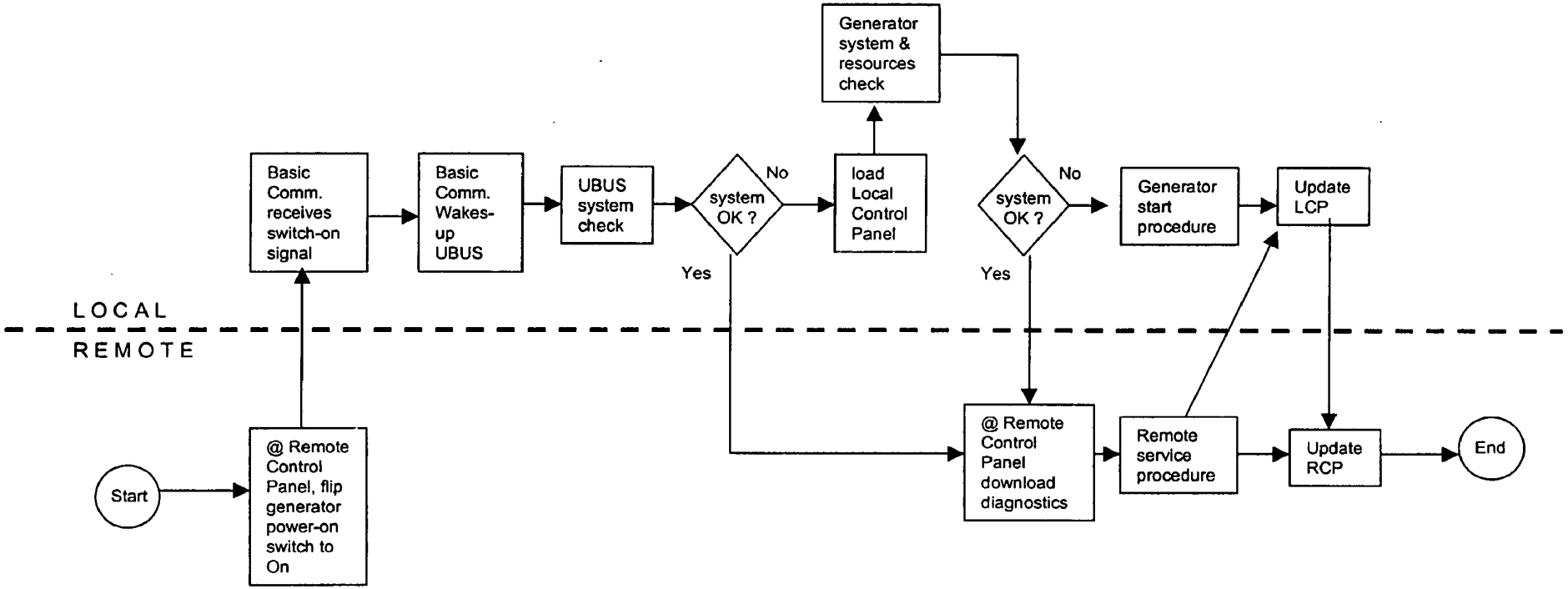
x – Sensors

x – Assembly: chassis, hook-up

By: N. Jagolino & B. Berg



PR 014 – Generator Auto-Power-Down	Version: 11/10/2003
When the following ERBUS system status occurs, UBUS will evoke auto-power-down mode (014): (1) UBUS/Basic Comm. Storage battery is fully charged, and (2) there is no demand from all ERBUS modules connected to the UBUS.	
Remote: ERBUS Service Center (ESC)	
Local: ERBUS Unit	By: N. Jagolino



PR 012 – Remote Generator Power-Up	Version: 11/05/2003
To activate a remote ERBUS unit. The corresponding generator power-0n switch is flipped at the remote control panel (RCP).	
Remote: ERBUS Service Center (ESC)	
Local: ERBUS Unit	By: N. Jagolino